

Speaker:**Dr Luca Modenese**

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Industrial Engineering



Title: Personalised neuro-musculoskeletal modelling: from image-based models to motoneuron-driven simulations

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Where: Aula 2.6, Sede Risorgimento
(viale del Risorgimento 2, Bologna)

Language: English

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ABSTRACT

Musculoskeletal models are computational representations of the musculoskeletal system and neural control of movement that can be used to simulate human motion. In this talk, I will present some recent technical developments that my group has achieved for generating, in a fully automated way, accurate models of the musculoskeletal system of individuals from standard medical images. Building on that, I will present a motoneuron driven model of the neuromuscular control that we have recently developed using spike trains of motor units obtained from decomposition of high-density electromyographic recording as input. This personalised neural controller, when coupled with image-based models, represents the highest level of neuromuscular personalisation currently achievable in vivo with non-invasive techniques.

BIOSKETCH

Luca Modenese graduated *summa cum laude* in Mechanical Engineering from the University of Padova (Italy) and was awarded a PhD in biomechanics from Imperial College London in 2013. After that he worked as postdoctoral researcher at the Centre for Musculoskeletal Research (Griffith University, Australia) and INSIGNEO Institute for in silico Medicine (University of Sheffield, UK). In 2013, he was a visiting scholar at the Neuromuscular Biomechanics Lab at Stanford University. In 2017, Luca was awarded a prestigious Imperial College Research Fellowship in computational biomechanics and since 2022 he is a Scientia Senior Lecturer in the Graduate School of Biomedical Engineering of the University of New South Wales in Sydney, Australia. Luca has published more than 45 publications and is a strong advocate of open science: he maintains several open-source projects, including the popular [awesome-biomechanics](#) public list of resources.